SANDVIK

SANDVIK SAF™ 3207 HD STRIP STEEL

DATASHEET

Sandvik SAF™ 3207 HD is a hyper duplex (austenitic-ferritic) stainless steel for service in highly corrosive conditions where high mechanical strength is also necessary. This makes the grade ideal for marine applications subjected to static or dynamic loading. The grade is characterized by:

- Excellent resistance to pitting and crevice corrosion
- Excellent resistance to stress corrosion cracking (SCC) in hydrogen sulphide (H_2S) and chloride containing environments
- High resistance to general corrosion in acidic and caustic environments
- Excellent resistance to erosion corrosion
- Excellent corrosion fatigue properties
- Exceptionally high mechanical strength
- Exceptionally high fatigue strength
- Physical properties that offer design advantages
- Good weldability

STANDARDS

- UNS: S33207

CHEMICAL COMPOSITION (NOMINAL) %

Chemical composition (nominal) %

C	Si	Mn	P	S	Cr	Ni	Mo
≤0.030	≤0.8	≤1.5	≤0.035	≤0.010	32	7	3.5

Others: N=0.5

FORMS OF SUPPLY

The strip steel can be supplied in coils, bundles, on plastic spools or in lengths. The edges can be either slit, deburred or smoothly rounded.

Conditions and dimensions

Sandvik SAF™ 3207 HD is supplied in solution annealed (bright annealed or annealed and pickled) or cold rolled condition.

Thickness, mm	Width, mm	Thickness, in.	Width
mm	mm	in.	in.
0.015 - 3.5	2 - 300	0.0006 - 0.14	0.078 - 12

MECHANICAL PROPERTIES

Static strength, nominal values at 20°C (68°F)

Condition	Tensile strength, R_m		Proof strength, $R_{p0,2}$		Elongation, $A_{11,3}$
	MPa	ksi	MPa	ksi	%
A	1000	145	800	116	30
C	1450	210	1300	189	6
C	1800	261	1500	218	4

$R_{p0,2}$ corresponds to 0.2% offset yield strength. 1 MPa = N/mm^2
A = Solution annealed C = Cold rolled

Fatigue strength

Owing to its high strength, Sandvik SAF™ 3207 HD has very good fatigue properties. The typical fatigue limit in reversed loading for 2 million cycles is about 40% of the tensile strength.

Relaxation resistance

The two-phase structure and high yield strength of Sandvik SAF™ 3207 HD improves the resistance towards relaxation. Long-term bending tests have shown that austenitic grades of similar strength suffer from considerably higher relaxation. This means that a statically loaded spring made of Sandvik SAF 3207 HD will retain its force for a longer period of time.

Bending

Despite its high strength, Sandvik SAF™ 3207 HD can be readily formed and bent. In the solution annealed condition, the strip steel can be bent using a radius which is smaller than the strip thickness.

PHYSICAL PROPERTIES

Density: 7.7 g/cm^3 (0.28 lb/in^3)

Modulus of elasticity

The modulus of elasticity of Sandvik SAF™ 3207 HD is about 200 GPa at 20°C (29x10^3 ksi at 68°F). During loading at stresses just below the yield strength, $R_{p0.2}$, austenitic grades usually show a weakening modulus. Duplex strip steel however retains its modulus in a better way.

Resistivity

Temperature, °C	μΩm	Temperature, °F	μΩin
20	0.87	68	34.1

Specific heat capacity

Temperature, °C	J/(kg °C)	Temperature, °F	Btu/(lb °F)
20	480	68	0.12
100	510	200	0.12
200	540	400	0.13
300	570	600	0.13
400	590	800	0.14

Thermal conductivity

Temperature, °C	W/m °C	Temperature, °F	Btu/ft h°F

20	13	68	7
100	15	200	9
200	16	400	9
300	18	600	10
400	20	800	12

Thermal expansion

Temperature, °C	x10-6/°C	Temperature, °F	x10-6/°F
30-100	13.5	86-200	7.5
30-200	13.5	86-400	7.0
30-300	14.0	86-600	8.0
30-400	14.5	86-800	8.0

CORROSION RESISTANCE

General corrosion

Sandvik SAF™ 3207 HD is highly resistant to corrosion by organic acids (formic acid) and inorganic acids (sulphuric acid and hydrochloric acid) as shown in figures 1-3.

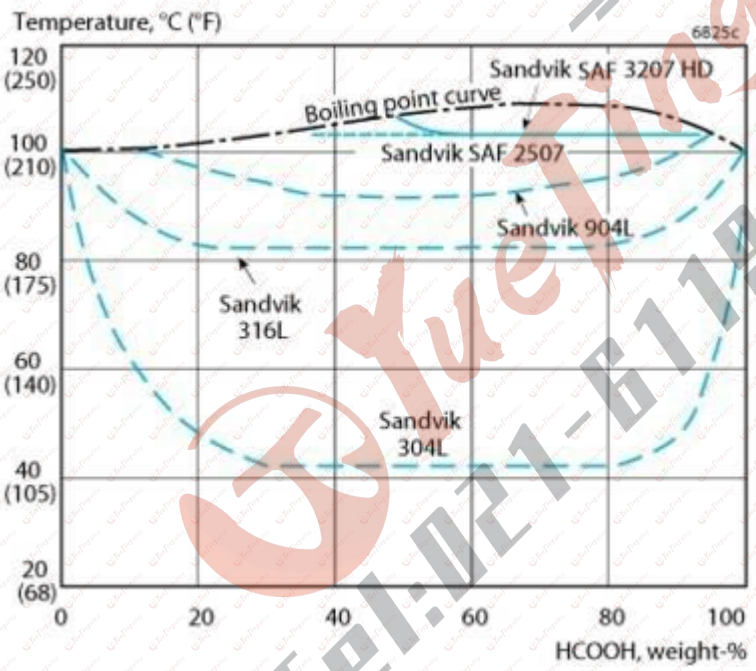

Figure 1. Isocorrosion diagram in formic acid. The curves represent a corrosion rate of 0.1 mm/year (4 mpy) in a stagnant test solution.

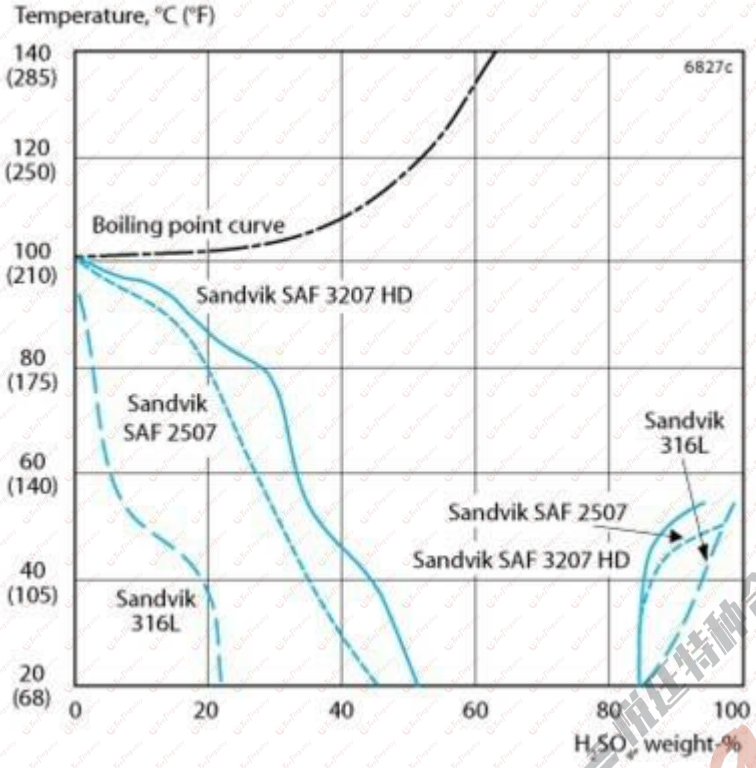

Figure 2. Isocorrosion diagram in sulphuric acid. The curves represent a corrosion rate of 0.1 mm/year (4 mpy) in a stagnant test solution.

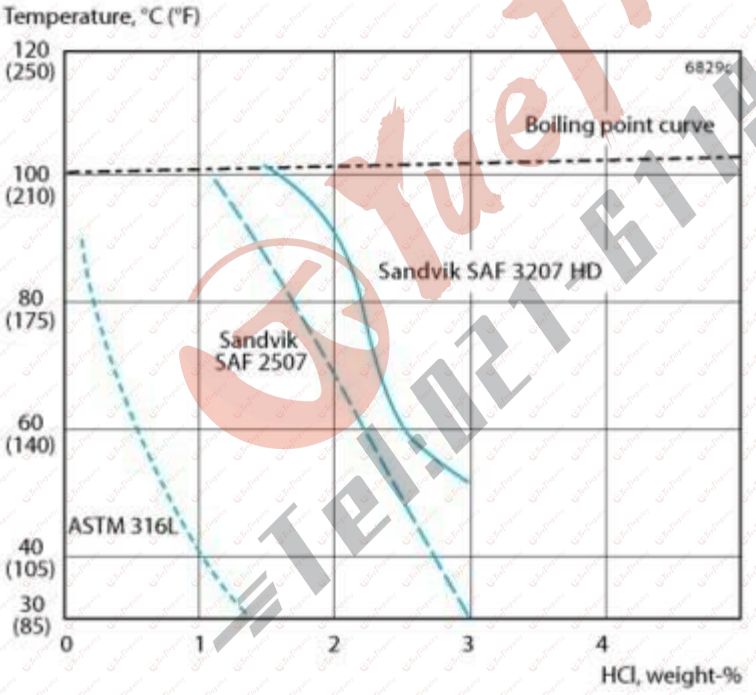

Figure 3. Isocorrosion diagram in hydrochloric acid. The curves represent a corrosion rate of 0.1 mm/year (4 mpy) in a stagnant test solution.

Pitting and crevice corrosion

Sandvik SAF™ 3207 HD is highly resistant to pitting and crevice corrosion due to high alloying levels of chromium, molybdenum and nitrogen, as shown in figures 4-5. Welding can be expected to decrease the corrosion

resistance and is recommended to be performed with the support of Sandvik.

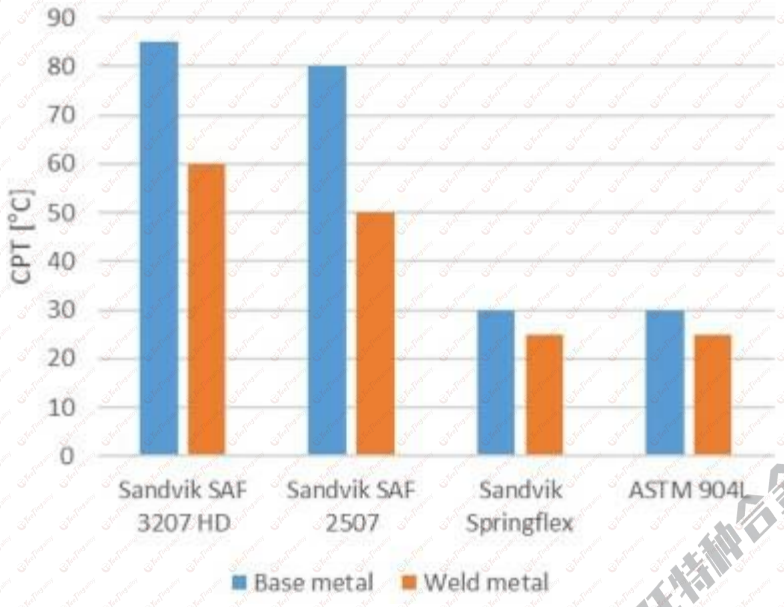

Figure 4. Critical pitting temperature (CPT) determined in the ASTM G48A test where the samples are exposed to 6% FeCl3 solution for 24h and the temperature when pitting starts to develop is determined.

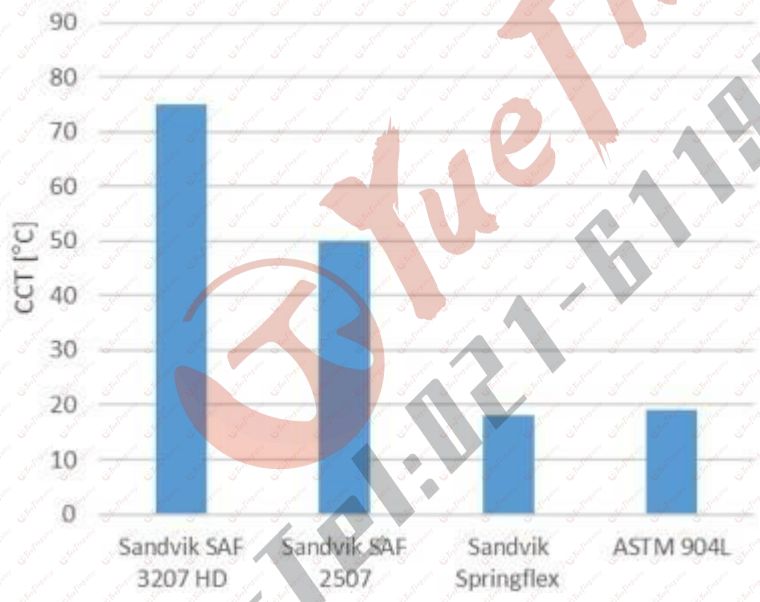

Figure 5. Approximate values for the critical crevice corrosion temperature (CCT) after exposure in 6% FeCl3 solution for 24h according to ASTM G48B. In practice the values may differ somewhat from these owing to variations in crevice gap and surface condition.

Stress corrosion cracking

The standard austenitic steels of the ASTM 304L and 316L types are prone to stress corrosion cracking (SCC) in chloride bearing solutions at temperatures above 60°C (140°F). Duplex stainless steels are far less prone to this type of corrosion. Practical experience and laboratory tests have shown their good resistance to stress corrosion

cracking.

Intergranular corrosion

In Sandvik SAF™ 3207 HD the chemical composition is balanced in such a manner that the reformation of austenite in the heat affected zone of a weld takes place quickly. This results in a microstructure that gives corrosion properties and toughness roughly equal to that of the parent metal. Welded joints in duplex stainless steels easily pass the intergranular corrosion test according to ASTM A262 Practice E (Strauss test).

HEAT TREATMENT

If it is necessary to restore the duplex structure after a fabrication operation, this should be done by solution annealing in a protective atmosphere at 1080-1150°C (1976-2102°F), followed by rapid cooling in air.

WELDING

Sandvik SAF™ 3207 HD has good weldability with a good austenite reformation in the heat affected zone. This gives the welded joint good toughness, strength and corrosion resistance.

For obtaining the best mechanical properties and corrosion resistance of the weld metal and heat affected zone, the heat input should be within the interval 0.2-1.0 kJ/mm. The interpass temperature should be below 100°C (212°F). For GTAW/TIG a suitable filler wire grade is Sandvik 27.7.5.L.

For further recommendations on suitable welding parameters, please contact Sandvik.

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